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Han

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(54) **SCREEN MASK**

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101/128, 128.1, 129; 38/102, 102.1, 102.8,
38/102.9; 160/378-381

(71) Applicant: **Samsung Display Co., Ltd.**, Yongin,
Gyeonggi-do (KR)

See application file for complete search history.

(72) Inventor: **Jeong-Won Han**, Yongin (KR)

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(73) Assignee: **Samsung Display Co., Ltd.**, Yongin-si
(KR)

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

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(21) Appl. No.: **13/961,776**

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B41F 15/34 (2006.01)
B41F 15/18 (2006.01)
H05K 3/12 (2006.01)
B41L 13/02 (2006.01)
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Primary Examiner — Blake A Tankersley

Assistant Examiner — Marissa Ferguson Samreth

(74) *Attorney, Agent, or Firm* — Christie, Parker & Hale,
LLP

(52) **U.S. Cl.**

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(2013.01); **B41F 15/18** (2013.01); **B41F 15/34**
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3/1216 (2013.01); **H05K 3/1225** (2013.01)

(57) **ABSTRACT**

A screen mask for screen printing includes a mask, and a
frame configured to support the mask with a tension; the
frame including a fixing frame and a moving frame config-
ured to support the mask and movably mounted on the fixing
frame, wherein the tension is controlled by the moving frame.

(58) **Field of Classification Search**

CPC B41F 15/34; B41F 15/36; B41F 15/18;
B41F 13/02; B41F 15/0813; B41F 15/0845;
B41F 15/0881; H05K 3/1225

10 Claims, 5 Drawing Sheets

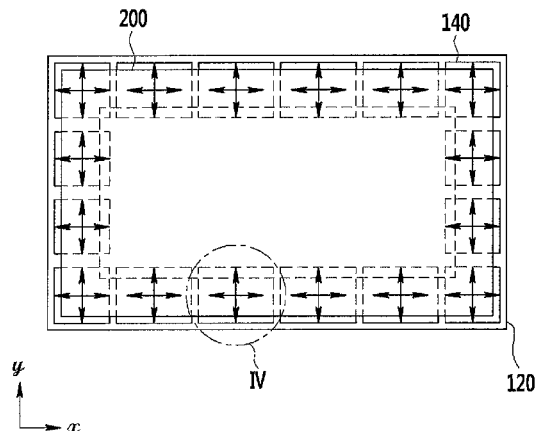


FIG. 1

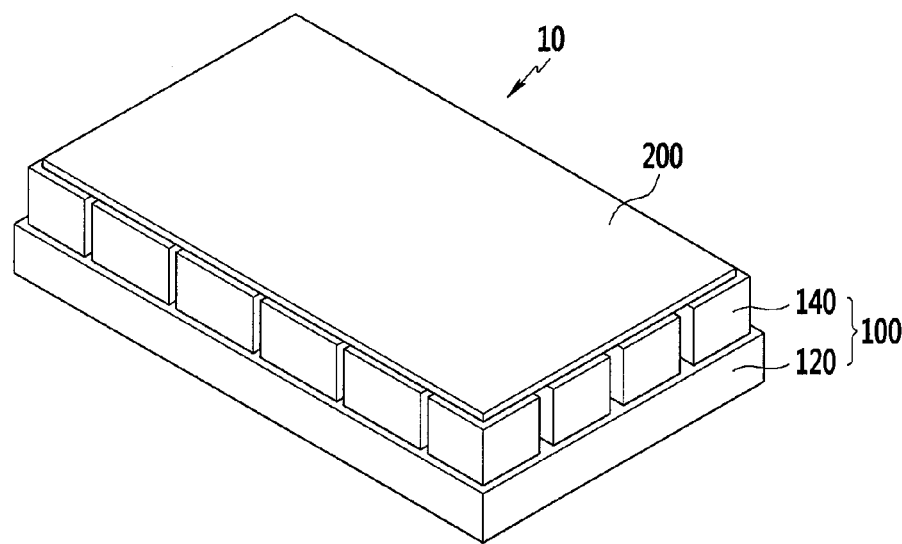


FIG. 2

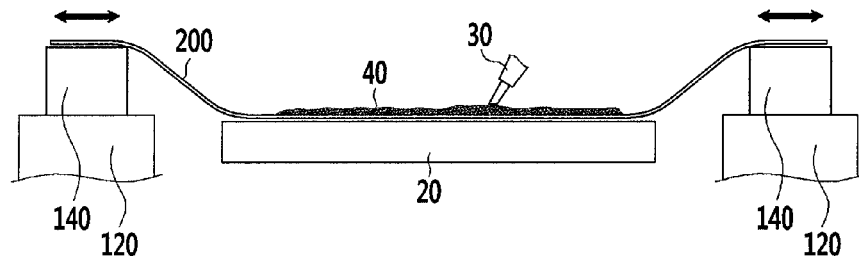


FIG. 3

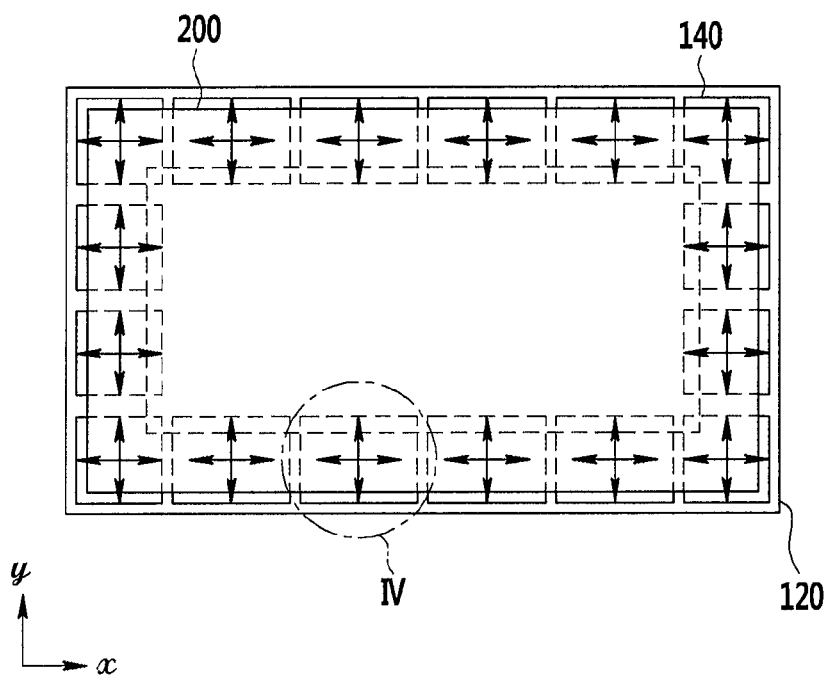


FIG. 4

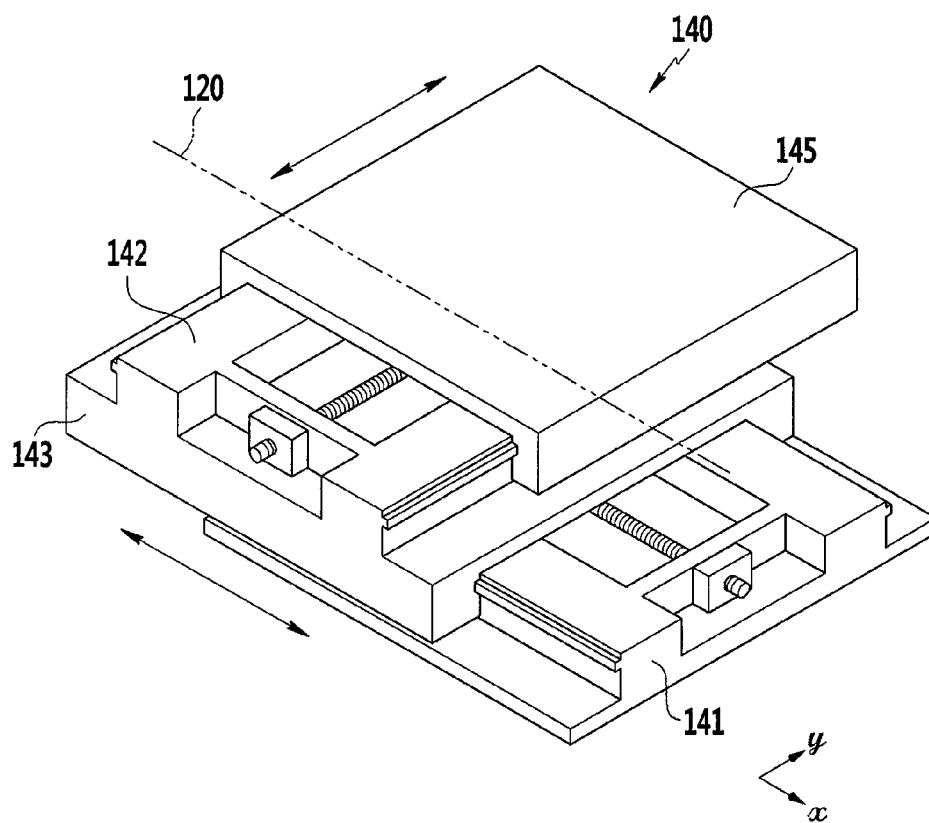
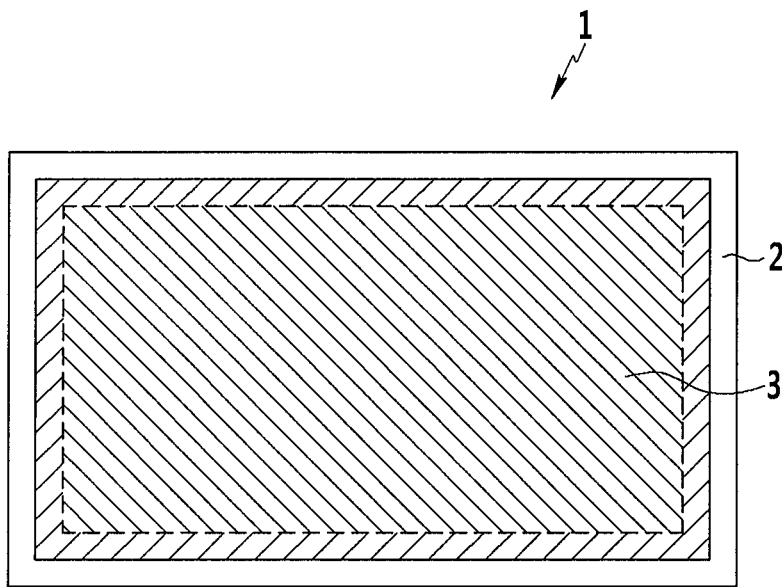


FIG. 5



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SCREEN MASK**CROSS-REFERENCE TO RELATED APPLICATION**

This application claims priority to and the benefit of Korean Patent Application No. 10-2012-0147541 filed in the Korean Intellectual Property Office on Dec. 17, 2012, the entire contents of which are incorporated herein by reference.

BACKGROUND**(a) Field**

The present invention relates to a screen mask for a screen printer.

(b) Description of the Related Art

A flat panel display is manufactured, in part, by forming a function layer for performing various functions on a substrate.

The function layer is manufactured through a thin-film process and a thick-film process, and a thick film may be formed by a screen printing process, a sandblast process, or a dry film process.

The screen printing process has good production efficiency and low processing cost, so it is widely used when high precision is not needed.

To form a fine pattern using the screen printing process, a mask with the same pattern as a pattern to be formed on the substrate is arranged on the substrate, and a source material is printed according to the pattern on the substrate, thereby forming a desired pattern.

After the mask is initially manufactured, a necessary amount of the mask is cut and it is attached or assembled to a mask frame to be used for the screen printing process.

In general, the mask frame to which the mask is attached is manufactured to be a high-precision, fixed body.

Therefore, when the mask is attached to the mask frame, it is generally impossible to increase or decrease the tensile force applied to the mask. If the mask is erroneously attached to the mask frame, the used mask is either detached from the mask frame and attached again thereto or the mask is discarded. Further, the size, uniformity, and position of an opening in the mask can be changed during the screen printing process, requiring the mask be reattached to the mask frame or discarded.

FIG. 5 shows a top plan view of a conventional screen mask used to print a screen. Here, the screen mask 1 includes a mask 3 on which a pattern is formed and a frame 2 to which the mask 3 is attached and supported by, and the tensile force is typically not added to or subtracted from the mask 3 once it is attached to the frame 2.

The above information disclosed in this Background section is only for enhancement of understanding of the background of the invention and therefore it may contain information that does not form the prior art that is already known in this country to a person of ordinary skill in the art.

SUMMARY

The present invention has been made in an effort to provide a screen mask with precisely controllable tension and for controlling tension in at least two directions.

An exemplary embodiment of the present invention provides a screen mask for screen printing including a mask and a frame configured to support the mask with a tension, the frame including a fixing frame and a moving frame config-

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ured to support the mask and movably mounted on the fixing frame, wherein the tension is controlled by the moving frame.

A plurality of moving frames may support an edge of the mask.

Each of the plurality of moving frames may be movable in at least two directions.

Each of the plurality of moving frames may be movable in two directions that are perpendicular to each other and on a plane that is parallel with the mask.

The mask may have a rectangular shape, and each of the plurality of moving frames may be movable in directions that are parallel to two adjacent sides of the mask.

The moving frame includes a first rail installed at the fixing frame, a first carriage movable along the first rail and including a second rail perpendicular to the first rail, and a second carriage movable along the second rail and supporting one side of the mask.

The first carriage may be mounted on the first rail, and the second carriage may be mounted on the second rail, the second rail being at the top of the first carriage.

The first carriage and the second carriage may be moved by a ball screw.

The ball screw may be configured to be driven by a driving motor.

The ball screw may be configured to be driven manually.

According to embodiments of the present invention, a plurality of moving frames configured to support the mask are movable in at least two directions, thereby precisely controlling the tension of the mask.

The tension supporting the mask is precisely controllable, thereby reducing or preventing undesired reinstallation and/or replacement of the mask. Additional aspects and/or features of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description or may be learned by practice of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a perspective view of a screen mask according to an exemplary embodiment of the present invention.

FIG. 2 shows a screen printing process using a screen mask according to an exemplary embodiment of the present invention.

FIG. 3 shows a top plan view of a screen mask according to an exemplary embodiment of the present invention.

FIG. 4 shows an enlarged view of a part IV shown in FIG. 3.

FIG. 5 shows a top plan view of a conventional screen mask.

DETAILED DESCRIPTION

The present invention will be described more fully herein after with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. As those skilled in the art would realize, the described embodiments may be modified in various different ways, all without departing from the spirit or scope of the present invention.

The drawings and description are to be regarded as illustrative in nature and not restrictive. Like reference numerals designate like elements throughout the specification. The size and thickness of each configuration shown in the drawings are arbitrarily shown for understanding and ease of description, but the present invention is not limited thereto.

FIG. 1 shows a perspective view of a screen mask according to an exemplary embodiment of the present invention. FIG. 2 shows a screen printing process using a screen mask

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according to an exemplary embodiment of the present invention. FIG. 3 shows a top plan view of a screen mask according to an exemplary embodiment of the present invention. FIG. 4 shows an enlarged view of a part IV shown in FIG. 3.

Referring to FIG. 1, the screen mask **10** according to an exemplary embodiment of the present invention is used for a screen printing process and includes a mask **200** and a frame **100**.

The mask **200** is a printing mask on which a pattern to be printed on a substrate **20** of a display device is formed, and, according to an exemplary embodiment of the present invention, the mask **200** can be configured by coating a mesh member (or a plurality of mesh members) with a specific emulsion and forming an opening (or a plurality of openings) that corresponds to the pattern to be printed.

The mesh member (or a plurality of mesh members) may be formed of metal.

The mask **200** can be supported by the frame **100** with a tension (e.g., a predetermined tension).

Referring to FIG. 2, the mask **200** supported with the tension by the frame **100** is provided on the substrate **20**, on which the pattern is formed. A printing material **40** is deposited on (e.g., supplied to) the mask **200** using a pressurizing apparatus **30** (e.g., nozzle) so that the printing material **40** may be passed through the opening (or openings) (not shown) formed in the mask **200**, and the pattern may be printed on the substrate **20**.

In an embodiment and as shown with arrows in FIG. 2, the screen mask **10** can control the tension supporting the mask **200** because frames **120** and **140** supporting the mask **200** are configured to be movable. The frame **100** for (e.g., configured for) supporting the mask **200** will now be described in detail.

As described, the frame **100** supports the mask **200** with a tension (e.g., a predetermined tension).

In one embodiment, the frame **100** includes a fixing frame **120** and a moving frame **140** so as to control the tension that supports the mask **200**.

The fixing frame **120** supports the moving frame **140**, and it can be formed to be a quadrangle and can be made of a rigid material, such as metal.

However, without being restricted to the quadrangle form and the metallic material, the fixing frame **120** can be formed to have various shapes and/or with various materials.

The moving frame **140** supporting the mask **200** can be movably installed (e.g., mounted) on the fixing frame **120**.

In this embodiment, the moving frame **140** can fix and support an edge of the mask **200**.

Accordingly, the tension of the mask **200** fixed to the moving frame **140** can be controlled (e.g., adjusted) by moving the moving frame **140**.

The edge of the mask **200** can be attached to the moving frame **140** through a fastening apparatus or method (e.g., predetermined fastening apparatus or method) (not shown).

Here, the fastening apparatus or method can be a known fastening member, such as a bolt, or it can be a weld (e.g., configured through welding).

However, without being restricted to this, the fastening apparatus or method can be configured in various ways allowing the edge of the mask **200** to be attached to the moving frame **140**.

There can be multiple (e.g., a plurality of) moving frames **140**.

As shown in FIG. 1 and FIG. 3, a plurality of moving frames **140** can be installed in (e.g., mounted on) the fixing frame **120**, and each of the plurality of moving frames **140** can be individually moved.

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The moving frames **140** can be moved in at least two directions (e.g., two axes or two axial directions).

As shown in FIG. 3, the moving frames **140** can be moved in two directions that intersect (e.g., cross each other) and are on (e.g., provided on) a plane that is parallel to the mask **200**.

Referring to FIG. 3, the fixing frame **120** and the mask **200** can be rectangular, and the moving frames **140** installed in (e.g., mounted on) the fixing frame **120** can be moved in directions that are parallel to two neighboring sides of the fixing frame **120** or the mask **200**, for instance, the x-axis direction and y-axis direction.

Therefore, the screen mask **10** moves the moving frames **140** individually, thereby precisely controlling (e.g., adjusting) the tension of the mask **200** supported by the frame **100**.

When the number of moving frames **140** is increased, the tension can be more precisely controlled, and the number of moving frames **140** is variable according to the size of the mask **200** and/or of the fixing frame **120** and a required degree of control (e.g., control degree) of the tension supporting the mask **200**.

For example, the mask **200** (e.g., rectangular mask) can be configured with at least one moving frame **140** for each side (e.g., each supported side) of the mask **200**.

The respective moving frames **140** can be moved in at least two directions (e.g., two axes or two axial directions), and a detailed configuration of the moving frame **140** for realizing (e.g., controlling) the movement will be described.

Referring to FIG. 4, each of the plurality of moving frames **140** installed in the screen mask **10** can be configured into (e.g., configured as) a single unit so that they may be moved in two directions (e.g., two axial directions) individually.

Each moving frame **140** includes a first carriage **143** and a second carriage **145**. Each moving frame **140** is configured to move on a first rail **141**.

Here, the first rail **141** is formed on one side of the fixing frame **120**, and it can form a straight (or substantially straight) guide rail.

The first rail **141** is installed in (e.g., mounted on or formed on) the fixing frame **120** in the x-axis direction with respect to FIG. 4.

The first rail **141** is formed in a direction that is parallel to one side of the mask **200** (e.g., rectangular mask).

The first carriage **143** can be moved along the first rail **141**, a structure (e.g., a groove) that corresponds to the first rail **141** is formed on one side of the first carriage **143** so as to move along (e.g., interact with) the first rail **141**, and a second rail **142** can be formed in a direction that is perpendicular to the first rail **141** on another side of the first carriage **143**.

The second rail **142** can be formed as a straight (or substantially straight) guide rail at the top of the first carriage **143**, and it can be formed in the y-axis direction that is perpendicular to the x-axis direction as shown in FIG. 4.

The second rail **142** can be formed in a direction that is parallel to another side of the mask **200** (e.g., rectangular mask) that neighbors the side of the mask **200** that is parallel to the first rail **141** that is described above.

The second carriage **145** can be moved along (e.g., interact with) the second rail **142** formed on the first carriage **143**, and it can support one edge of the mask **200** (e.g., rectangular mask).

One edge of the mask **200** can be attached to the second carriage **145** through a known fastening apparatus or by a known fastening method, such as welding.

Each moving frame **140** includes the first carriage **143** that moves in the x-axis direction along the first rail **141** formed on the fixing frame **120** and the second carriage **145** that moves in the y-axis direction along the second rail **142** formed on the

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first carriage **143**, so it can be moved in two directions (e.g., two axes or two axial directions), and the tension of the mask **200** supported by the moving frames **140** can be precisely controlled (e.g., adjusted).

Each moving frame **140** may include a ball screw and a linear guide.

The first rail **141** and the second rail **142** can be configured with (e.g., include or be formed as) the linear guide, and the first carriage **143** and the second carriage **145** can be configured to be movable by the ball screw.

The described ball screw and the linear guide can be automatically operated through a drive motor.

However, without being restricted to this, the operational configuration of the moving frame **140** is changeable in many ways, and, for instance, it can be configured to be manually operable.

As shown in FIG. **4**, the first rail **141**, the first carriage **143**, the second rail **142**, and the second carriage **145** can be sequentially disposed (e.g., sequentially located) in order from bottom to top.

Therefore, one side of the mask **200** can be moved in two directions (e.g., two axial directions) that are perpendicular to each other by using a simple configuration.

The screen mask **10** is configured such that the moving frames **140** supporting the mask **200** may be moved in at least two directions (e.g., two axes two or axial directions), thereby precisely controlling the tension that supports the mask **200**.

Accordingly, the problem of unnecessarily reinstalling or exchanging the mask **200** after it is installed in the frame **100** because of lack of control of tension or position is prevented to save time and cost, and efficiency of the screen printing process is improved.

While this invention has been described in connection with what is presently considered to be practical exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims and their equivalents.

What is claimed is:

1. A screen mask for screen printing, the screen mask comprising:

a mask; and

a frame configured to support the mask with a tension, the frame comprising:

a fixing frame; and

a moving frame configured to support a single edge of the mask and movably mounted on the fixing frame,

wherein the tension is controlled by the moving frame, and wherein the moving frame is movable in at least two directions with respect to the fixing frame, the at least two directions being perpendicular to each other.

2. The screen mask of claim **1**, wherein the frame further comprises:

a plurality of moving frames supporting the mask.

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3. The screen mask of claim **2**, wherein

each of the plurality of moving frames is movable in two directions that are perpendicular to each other and on a plane that is parallel with the mask.

4. The screen mask of claim **3**, wherein

the mask has a rectangular shape, and

each of the plurality of moving frames is movable in directions that are parallel to two adjacent edges of the mask.

5. A screen mask for screen printing, the screen mask comprising:

a mask; and

a frame configured to support the mask with a tension, the frame comprising:

a fixing frame; and

at least three moving frames, each of the moving frames supporting an edge of the mask and movably mounted on the fixing frame,

wherein the tension is controlled by the plurality of moving frames, and

wherein each of the moving frames is movable in at least two directions with respect to the fixing frame, the at least two directions being perpendicular to each other.

6. A screen mask for screen printing, the screen mask comprising:

a mask; and

a frame configured to support the mask with a tension, the frame comprising:

a fixing frame; and

a moving frame configured to support the mask and movably mounted on the fixing frame,

wherein the tension is controlled by the moving frame, wherein the moving frame is movable in at least two directions that are perpendicular to each other, and

wherein moving frame comprises:

a first rail installed at the fixing frame;

a first carriage movable along the first rail, and comprising a second rail perpendicular to the first rail; and

a second carriage movable along the second rail and supporting one edge of the mask.

7. The screen mask of claim **6**, wherein

the first carriage is mounted on the first rail, and the second carriage is mounted on the second rail, the second rail being at a top of the first carriage.

8. The screen mask of claim **6**, wherein

the first carriage and the second carriage are moved by a ball screw.

9. The screen mask of claim **8**, wherein

the ball screw is configured to be driven by a driving motor.

10. The screen mask of claim **8**, wherein

the ball screw is configured to be driven manually.

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